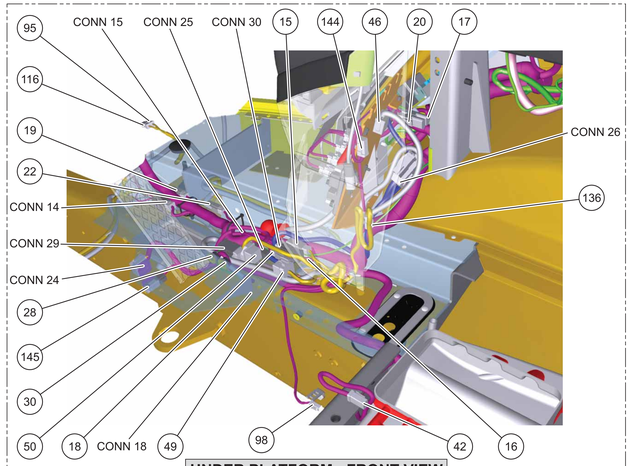
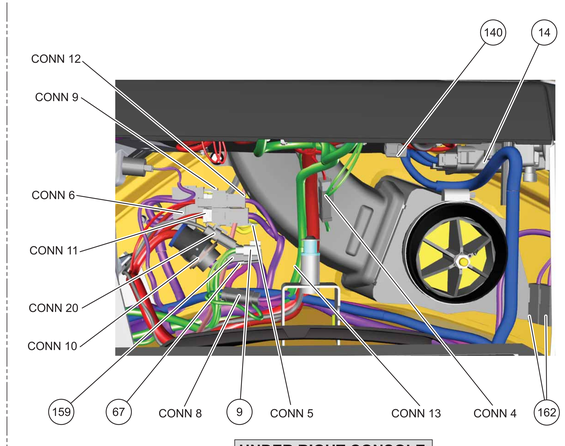
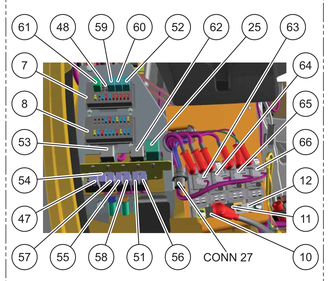


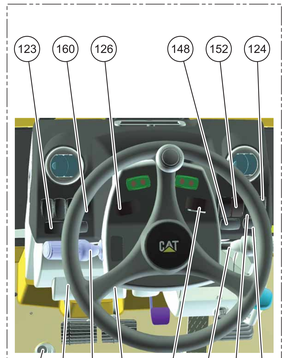
UNDER PLATFORM - FRONT VIEW

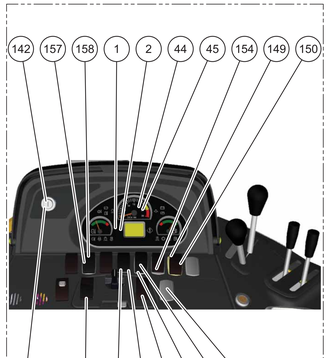


UNDER RIGHT CONSOLE



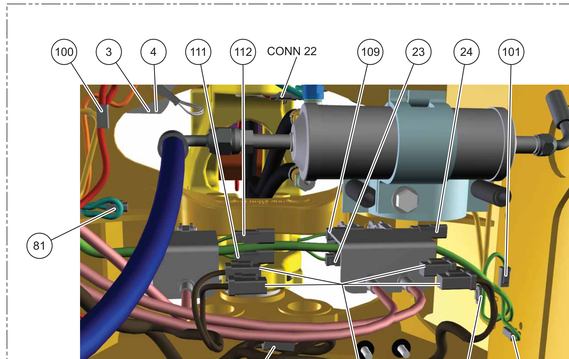
BLOCK GP - RELAY / FUSE



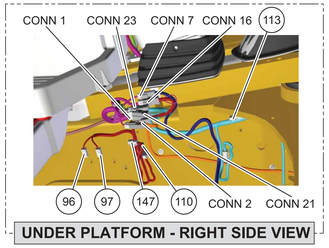


STEERING CONSOLE

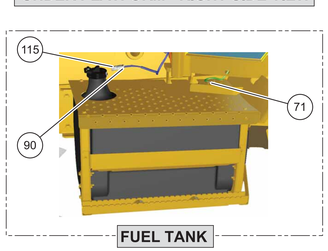
RIGHT CONSOLE



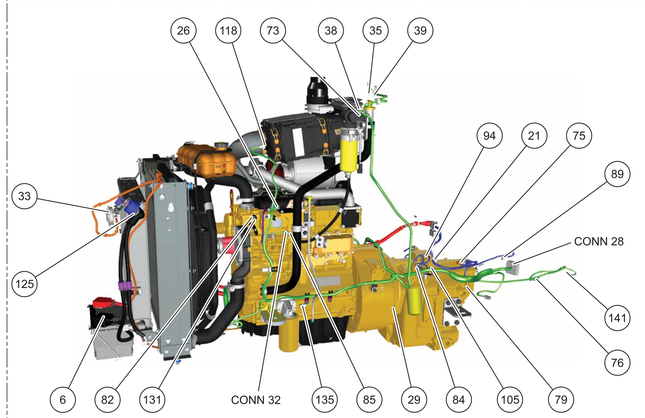
UNDER PLATFORM - REAR VIEW

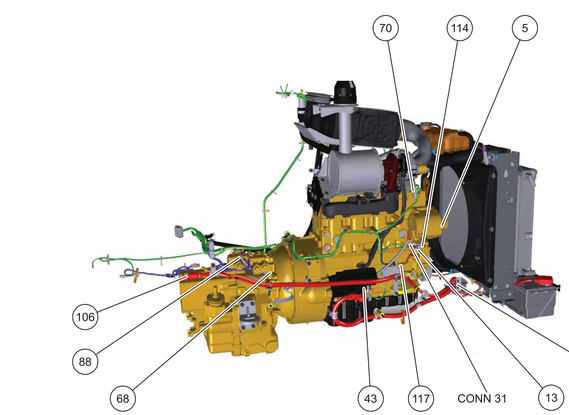


UNDER PLATFORM - RIGHT SIDE VIEW

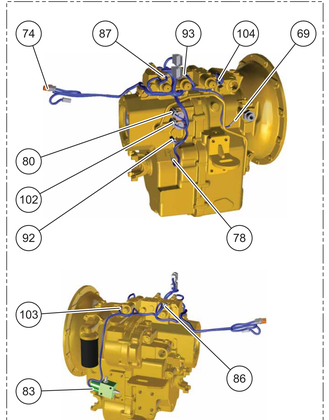


FUEL TANK

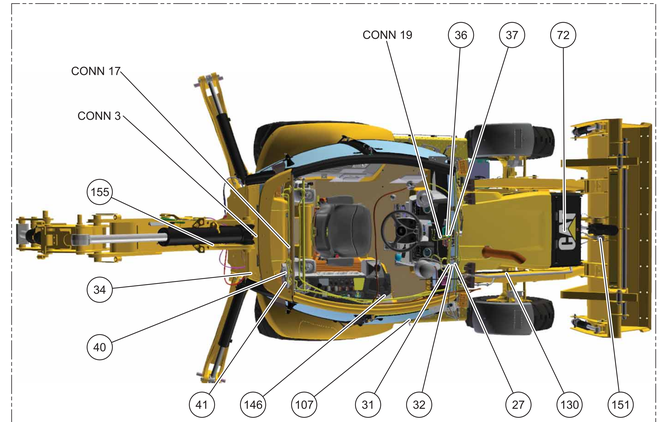




ENGINE WITH STD XMSN



XMXN - AUTOSHIFT



MACHINE TOP VIEW - CAB ROOF REMOVED

Component Location (Volume 1)

Component	Schematic Location	Machine Location
Alarm - Action	D-15	1
Alarm - Action	A-15	2
Alarm - Backup (CP)	H-10	3
Alarm - Backup (SS)	J-16	4
Alternator	F-3	5
Battery	F-5	6
Block As - Fuse	I-6	7
Block As - Fuse	G-6	8
Blower Gp - Cab heater	H-13	9
Bus Bar 1	J-8	10
Bus Bar 2	J-7	11
Bus Bar 3	J-7	12
Compressor Gp - A/C Clutch	H-3	13
Control Gp - AWS	A-9	14
Diode - Blocking 1	C-9	15
Diode - Blocking 2	C-9	16
Diode - Fuel Lift Pump	E-8	17
Diode - Lights (FR)	E-12	18
Diode - Lights (RR)	E-12	19
Diode - Next Lock Alarm	E-9	20
Diode - REV Solenoid	J-3	21
Diode - Roading	C-10	22
Diode - Side Shift 1	I-15	23
Diode - Side Shift 2	I-15	24
Flasher	F-8	25
Glow Plugs	F-3	26
Ground - Cab RF	D-10	27
Ground - Control	F-5	28
Ground - Engine	H-4	29
Ground - Lower Cab	F-8	30
Ground - Upper Cab	C-9	31
Ground - Upper Cab	D-12	32
Horn - Forward	D-3	33
Horn - RH	J-16	34
Motor Gp - Front Washer	D-3	35
Motor Gp - Front Wiper	D-3	36
Motor Gp - Front Wiper	C-9	37
Motor Gp - Fuel Lift Pump	F-3	38
Motor Gp - Rear Washer	D-3	39
Motor Gp - Rear Wiper	D-9	40
Motor Gp - Rear Wiper	C-12	41
Motor Gp - Seat	E-5	42
Motor Gp - Starter	E-4	43
Panel Gp - Instrument	E-15	44
Panel Gp - Instrument	B-15	45
Radio - Prod Link	I-4	46
Relay - A/C Shutoff	H-13	47
Relay - AWD	H-8	48
Relay - Dead Engine Lower Command	C-5	49
Relay - Dead Engine Lower Enable	C-5	50
Relay - Fuel Lift Pump	E-8	51
Relay - FWD Horn	I-6	52
Relay - HI Speed	H-13	53
Relay - Low Side Control	F-8	54
Relay - Next Lock Alarm	D-8	55
Relay - Neutral Start	E-8	56
Relay - Neutralizer	F-8	57
Relay - Park Brake Alarm	E-8	58
Relay - POS Lamp	H-8	59
Relay - Rear Horn	H-8	60
Relay - Ride Control	H-8	61
Relay - Start	B-5	62
Relay As - PRM Module 1	J-5	63
Relay As - PRM Module 2	J-7	64
Relay As - PRM Module END	J-7	65
Relay As - PRM Module HVAC	J-6	66
Resistor - Motor Speed	D-15	67
Sender - Conv Temp	I-3	68
Sender - Conv Temp	I-1	69
Sender - Coolant Temp	C-1	70
Sender - Fuel Level	C-3	71
Sensor - IFR Axle Pivot	A-11	72
Sensor - Fuel Water Separator	C-3	73
Sensor - HYD Load Auto	J-3	74
Sensor - HYD Load STD	J-5	75
Sensor - Hyd Oil Temp	H-3	76
Sensor - RR Axle Pivot	A-8	77
Sensor - XMSN Out SPD	J-3	78
Sensor - XMSN Out SPD STD	J-5	79
Solenoid - AWD AS	J-1	80
Solenoid - Bleed Valve	B-8	81
Solenoid - Cold Start Adv	F-3	82
Solenoid - Diff Lock AS	J-1	83
Solenoid - Diff Lock As STD	J-3	84
Solenoid - Fuel Shutoff Turbo	F-3	85
Solenoid - FWD High	J-1	86
Solenoid - FWD Low	I-1	87
Solenoid - FWD Low STD	J-3	88
Solenoid - HYD Torque Limit STD	J-3	89
Solenoid - LH Lock Valve	D-3	90
Solenoid - Lockout	I-15	91
Solenoid - Lockup Clutch	J-1	92
Solenoid - REV AS	I-1	93
Solenoid - REV As STD	J-3	94
Solenoid - RH Lock Valve	D-3	95
Solenoid - Ride Control 1	E-10	96
Solenoid - Ride Control 2	E-10	97
Solenoid - WTC	F-11	98
Solenoid - Side Shift Left	J-14	99
Solenoid - Side Shift Lock	J-16	100
Solenoid - Side Shift Right	I-15	101
Solenoid - Speed Clutch 1	J-1	102
Solenoid - Speed Clutch 2	J-1	103
Solenoid - Speed Clutch 3	J-1	104
Solenoid - STD AWD	J-3	105
Stud - Cab Power	G-4	106
Stud - Jump Start	G-6	107
Stud - Power	F-4	108
Suppressor - Lockout	I-16	109
Suppressor - ARC Ride Control	E-10	110
Suppressor - ARC (Side Shift Left)	J-14	111
Suppressor - ARC (Side Shift Right)	I-14	112
Suppressor - ARC (RS Lock)	J-16	113
Suppressor - ARC HVAC	H-3	114
Suppressor - ARC Load Check Disable 1	D-3	115
Suppressor - ARC Load Check Disable 2	D-3	116
Switch - A/C Refrigerant Pressure	H-3	117
Switch - Air Filter	D-3	118
Switch - Attach Rear Work Lamp	B-14	119
Switch - Attch Front Work Lamp	D-14	120
Switch - Attch Front Work Lamp	A-14	121
Switch - Attch Rear Work Lamp	D-14	122
Switch - AWD	J-8	123
Switch - AWS	A-11	124
Switch - Battery Disconnect	E-5	125
Switch - Beacon	G-10	126
Switch - Blower Speed	H-13	127
Switch - Brake (LH)	I-10	128
Switch - Brake (RH)	I-10	129
Switch - Bucket POS	F-10	130
Switch - Cold Start Adv	F-3	131
Switch - Column Multi Function	H-10	132
Switch - Creab Circle	A-11	133
Switch - Differential Lock	I-10	134
Switch - Engine Oil Pressure	D-3	135
Switch - Float Detent Pressure	D-3	136
Switch - FNR Control	I-10	137
Switch - Hazard	H-10	138
Switch - Heater A/C	H-10	139
Switch - Horn	E-14	140
Switch - HYD Oil Filter Bypass	H-3	141
Switch - Key	D-15	142
Switch - Key	A-10	143
Switch - Neutralizer Loader Handle	E-5	144
Switch - Neutralizer XMSN Handle	E-5	145
Switch - Park Brake	E-13	146
Switch - RC Pressure	E-10	147
Switch - Rear Fog Lamp	I-9	148
Switch - Rear Wiper	B-14	149
Switch - Rear Wiper	B-14	150
Switch - Return to Dig	F-10	151
Switch - Ride Control	I-9	152
Switch - Roading	H-9	153
Switch - Side Shift Lock	D-14	154
Switch - Stability Pressure	B-7	155
Switch - Stability Warning	B-10	156
Switch - Start Aid	C-14	157
Switch - Start Aid	A-14	158
Switch - Thermostat	H-15	159
Switch - XMSN Lock	J-9	160
Valve Gp - AWS	A-8	161
Valve Gp - Stabilizer	I-14	162

Connector Location (Volume 1)

Connector Number	Schematic Location
CONN 1	J-16
CONN 2	H-16, J-14
CONN 3	I-16
CONN 4	A-14, D-15, G-14
CONN 5	D-12, E-13, F-14
CONN 6	F-13, F-14
CONN 7	I-13
CONN 8	E-13, I-4-13
CONN 9	C-7, C-12, E-13
CONN 10	B-12, D-13
CONN 11	A-12, C-13
CONN 12	A-12, C-13
CONN 13	B-11, C-13
CONN 14	A-11, G-10
CONN 15	F-10, F-11
CONN 16	E-11
CONN 17	C-11
CONN 18	A-11
CONN 19	C-7, C-10
CONN 20	B-10
CONN 21	B-9
CONN 22	B-8
CONN 23	A-8
CONN 24	J-2, J-4, J-5
CONN 25	I-5
CONN 26	I-3, I-5
CONN 27	I-5
CONN 28	H-5
CONN 29	D-5
CONN 30	D-5
CONN 31	H-3
CONN 32	F-4

The connectors shown in this chart are for harness to harness connectors. Connectors that join a harness to a component are generally located at or near the component. See the Component Location Chart.

Resistor, Sender and Solenoid Specifications

Part No.	Component Description		Resistance (Ohms)*
244-3106	Sender:	Coolant Temp	54°C (130°F) - 950 to 716 110°C (230°F) - 72 to 61.8
362-3089	Sender:	Fuel Level (EST)	Empty: 246-252 Full: 27-33
363-8475	Sender:	Fuel Level (NON-EST)	Empty: 246-252 Full: 27-33
269-2212	Solenoid:	A/C Clutch	3.50 ± 0.15
305-3423	Solenoid:	Diff Lock, STD AWD, Speed Clutch 1	8.8 ± 0.4
238-4636	Solenoid:	Side Shift Left / Right	8.8
238-4638	Solenoid:	Ride Control / Lockout	7.3
274-8041	Solenoid:	Diff Lock	8 ± 0.5

* All room temperature unless otherwise noted.

Related Electrical Service Manuals

Title	Form Number
Starting Motor	SENR5025

CATERPILLAR®

UENR4049
April 2013

Schematic

416F, 422F, 428F, and 434F Backhoe Loader Electrical System

416F:	422F:	428F:	434F:
LWT323-UP	LRH696-UP	LBH1573-UP SJW437-UP	LDH1-UP FLY1-UP

Volume 1 of 2: Mechanical Control

Printed in U.S.A.

UENR4049 VOL 1 OF 2
42 Page, (Dimensions: 56 inches x 35 inches)

Harness And Wire Electrical Schematic Symbols

Symbols

Pressure Symbol | Temperature Symbol | Level Symbol | Flow Symbol | Circuit Breaker Symbol

Symbols and Definitions

Fuse: A component in an electrical circuit that will open the circuit if too much current flows through it.

Switch (Normally Open): A switch that will close at a specified point (temp, press, etc.). The circle indicates that the component has screw terminals and a wire can be disconnected from it.

Switch (Normally Closed): A switch that will open at a specified point (temp, press, etc.). No circle indicates that the wire cannot be disconnected from the component.

Ground (Wired): This indicates that the component is connected to a grounded wire. The grounded wire is fastened to the machine.

Ground (Case): This indicates that the component does not have a wire connected to ground. It is grounded by being fastened to the machine.

Reed Switch: A switch whose contacts are controlled by a magnet. A magnet closes the contacts of a normally open reed switch; it opens the contacts of a normally closed reed switch.

Sender: A component that is used with a temperature or pressure gauge. The sender measures the temperature or pressure. Its resistance changes to give an indication to the gauge of the temperature or pressure.

Relay (Magnetic Switch): A relay is an electrical component that is activated by electricity. It has a coil that makes an electromagnet when current flows through it. The electromagnet can open or close the switch part of the relay.

Solenoid: A solenoid is an electrical component that is activated by electricity. It has a coil that makes an electromagnet when current flows through it. The electromagnet can open or close a valve or move a piece of metal that can do work.

Magnetic Latch Solenoid: A magnetic latch solenoid is an electrical component that is activated by electricity. It has two coils (latch and unlatch) that make electromagnet when current flows through them. It also has an internal switch that places the latch coil circuit open at the time the coil latches.

Harness and Wire Symbols

Wire, Cable, or Harness Assembly Identification: Includes Harness Identification Letters and Harness Connector Serialization Codes (see example).

Wire Identification Letter(s): W, B, G, 1, ...AA, AB, AC, ...

Harness Connector Serialization Code: The "C" stands for "Connector" and the number indicates which connector in the harness (C1, C2, C3, ...).

Example: A2-C4 111-7898 | L-C12 35-5179 | L-C12 35-5179

Part Number: for Connector Plug

Part Number: for Connector Receptacle

Plug | Receptacle | Pin or Socket Number

Deutsch connector: Typical representation of a Deutsch connector. The plug contains all sockets and the receptacle contains all pins.

Fuse (5 Amps) | 3A | 8X-7122 | Component Part Number

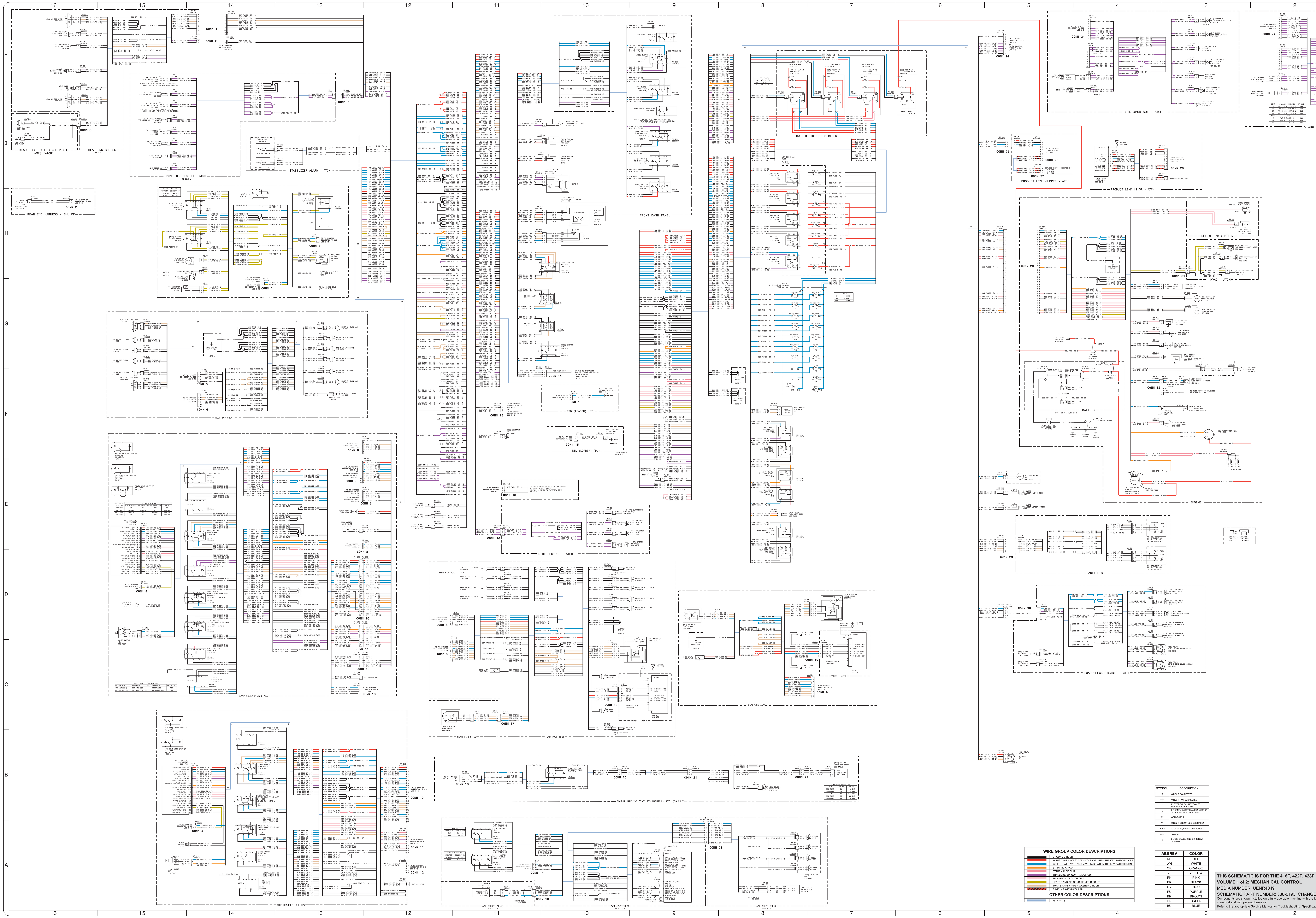
Sure-Seal connector: Typical representation of a Sure-Seal connector. The plug and receptacle contain both pins and sockets.

Harness identification code: This example has wire gauge, 325, wire 135 in harness "AG"

325-AG135 | PK-14 | Wire Gauge | Wire Color

UENR4049 VOL 1 OF 2

42 Page, (Dimensions: 56 inches x 35 inches)



IDENT	PART NO.	CHG	NOTE	DESCRIPTION
				HARNESS AS.
A	200-5728	02		RADIO
AC	359-0016	02	H	HVAC - CONSOLE
AE	238-7492	04	J	HVAC AIR CONDITION - ENGINE
EF	357-3200	03		ENGINE
EP	331-5496	03	H	HORN JUMPER
HL	331-5531	01		HEADLINER (CP ONLY)
LF	327-4172	03	J	REAR FOG LAMP & LICENSE PLATE
LN	357-3247	02	J	LOAD CHECK DISABLE
PE	357-3252	01	J	POWERED SIDE SHIFT
PM	357-3236	03		PLATFORM
PW	357-3222	04	H,J,S	RETURN TO DIG - PARALLEL LIFT (WITH LOCKS) (NON-EST)
PW	357-3225	01	H,J,S	RETURN TO DIG - PARALLEL LIFT (WITH LOCKS) (EST)
PW	385-0558	01		RETURN TO DIG - PARALLEL LIFT (WITHOUT LOCKS)
PX	357-3220	03	H,J	RETURN TO DIG (SINGLE TILT)
RA	357-3217	03		RIDE CONTROL (MECH)
RC	357-3219	01		REAR END (CP ONLY)
RF	357-3258	02		CONSOLE - SIDE (CP ONLY)
RH	331-5537	04		CONSOLE - SIDE
RK	331-5471	02	J	RIDE CONTROL (MECH AUTOSHIFT)
RL	357-3241	01		ROADING LIGHT
RN	290-6799	01		ROOF (CP ONLY)
RT	357-3206	03	H	REAR END (SS ONLY)
RW	311-1218	02	H	REAR WIPER
TA	331-5570	02	H,J	OBJECT HANDLING - SIDE
TC	357-3234	02	H,J	OBJECT HANDLING - REAR
TE	331-5571	02	H,J	OBJECT HANDLING - CAB
TF	349-1100	02	H,J	OBJECT HANDLING - HOE
TP	357-3238	01		ROOF (SS ONLY)
WA	357-3243	02	H,Y	AWS - REAR AXLE (EST ONLY)
WE	357-9536	02	H,Y	AWS - FRONT AXLE (EST ONLY)
WP	357-3244	02	H,Y	AWS - PLATFORM (EST ONLY)
WR	331-5529	01	J	PRODUCT LINK - RADIO - PL121SR
WT	331-5635	02	J	PRODUCT LINK JUMPER
XA	331-5465	03	H	XMSN AUTO SHIFT
XK	331-5463	04		XMSN STD SHIFT
				WIRE AS.
WC	246-0568	02	H	N/A ENGINE SHUTOFF
				CABLE AS.
AA	368-4714	04		+(POS) (MAIN POWER STUD TO STARTER)
CC	290-6746	01		+(POS) (STARTER TO ALTERNATOR)
EE	331-5555	04		-(NEG) (BATTERY TO DISCONNECT SWITCH)
FF	331-5556	02		-(NEG) (DISCONNECT SWITCH TO FRAME)
GG	331-5554	04	H	+(POS) (HEAVY DUTY)
HH	331-5557	04	H	-(NEG) (HEAVY DUTY)
JJ	331-5518	00		+(POS) (JUMP START)
KK	357-9523	01		+(POS) (BATTERY TO MAIN POWER STUD) (EST ONLY)
MM	331-5552	03		+(POS) (MAIN POWER STUD TO CAB POWER STUD)
NN	387-6490	02		-(NEG) (DISCONNECT SWITCH TO FRAME) (EST ONLY)
PP	368-6241	02		+(POS) (MAIN POWER STUD TO CAB POWER STUD) (EST ONLY)
RR	369-1751	01		+(POS) (BATTERY TO MAIN POWER STUD) (EST ONLY)
SS	331-5550	07		+(POS) (BATTERY TO MAIN POWER STUD)
TT	363-8477	03		+(POS) (CAB POWER STUD TO POWER DISTRIBUTION)
				STRAP AS.
EW	389-5678	00		STRAP - ECM TO ECM GROUND
-	8X-9618	01		STRAP-GROUND CAB TO FRAME
-	134-3355	01		STRAP-GROUND ENGINE TO FRAME

NOTE DESCRIPTION

NOTE A: ASSEMBLE TERMINALS TO DESIGNATED STUD

NOTE B: THERMOSTAT FITTED TO MACHINES WITH A/C ONLY.

NOTE C: WIRES ARE TWISTED. ONE TWIST PER 25mm. WIRES TO BE TWISTED ARE: 892-BR AND 893-GN, F711-GN AND F712-GY AND E900-WH AND E901-GN

NOTE D: NOT USED ON MECHANICAL MACHINE

NOTE E: CLOSED WHEN BRAKE IS DEPRESSED

NOTE F: CONNECT WIRE AS. FROM PIN 2 TO 3 ON CONNECTOR RH-C6.

NOTE H: OPTION BASED ON MACHINE CONFIGURATION.

NOTE J: ATTACHMENT HARNESS

NOTE K: WHEN LOADER LOCKS ARE INSTALLED, REMOVE JUMPER AND CONNECT PM-C46 TO LN-C2. IF POWER SHIFT OPTION IS USED CONN PL-C46 TO LN-C2

NOTE L: STD FRONT WORK AND STD REAR WORK SWITCHES ARE FOR STANDARD FLOOD LAMP ARRANGEMENTS (4 LAMPS TOTAL). ATCH FRONT WORK LAMP AND ATCH REAR WORK LAMP SWITCHES ARE FOR MACHINES WITH OPTIONAL ATTACHMENT FLOOD LAMPS (8 LAMPS TOTAL).

NOTE M: WHEN USING A CAB WITH HEATER ONLY, HEATER AC SW IS REPLACED WITH VENT SW.

NOTE N: NORMALLY CLOSED AT PROPER REFRIGERANT CHARGE

NOTE P: FOR MACHINES WITHOUT LOAD CHECK.

NOTE R: AWS SYSTEM AVAILABLE ON 434F AND 444F ONLY

NOTE S: NOT AVAILABLE ON 422F.

NOTE T: FOR HVAC ATTACHMENT CONNECT 122-BU FROM HVAC HARNESS TO HVAC PRM MODULE SB STUD.

NOTE V: FOR 434F STD XMSN MACHINES ADD JUMPER ASSY 8Y-7833 TO CONN PM-C21. FOR 434F AUTOSHIFT MACHINES ADD JUMPER ASSY 8Y-7833 TO CONN PL-C50.

NOTE W: FOR POWER SIDESHIFT OPTION REPLACE SIDE SHIFT LOCK SW WITH POWER SS SW.

NOTE X: FOR 434F MACHINES, REPLACE AWD SWITCH WITH AWD CONTINUOUS BRAKING SWITCH

NOTE Y: FOR 434F MECHANICAL EST MACHINES ONLY

NOTE Z: CONNECTION SUPPLIED WITH ENGINE

SYMBOL	DESCRIPTION
┼ (dot)	CIRCUIT CONNECTED
┼	CIRCUIT NOT CONNECTED
⏚	ELECTRICAL CONNECTION TO MACHINE STRUCTURE
⏚ (dashed)	INTERNAL ELECTRICAL CONNECTION TO SURFACE OF COMPONENT
→)—	CONNECTOR
H#	CIRCUIT GROUPING DESIGNATION
- - -	ATCH WIRE, CABLE, COMPONENT
○–○	SPLICE
○	BLADE, SPADE, RING OR SCREW TERMINAL

WIRE GROUP COLOR DESCRIPTIONS

(black)	GROUND CIRCUIT
(red)	WIRES THAT HAVE SYSTEM VOLTAGE WHEN THE KEY SWITCH IS OFF
(blue)	WIRES THAT HAVE SYSTEM VOLTAGE WHEN THE KEY SWITCH IS ON
(orange)	STARTING CIRCUIT
(pink)	START AID CIRCUIT
(purple)	TRANSMISSION CONTROL CIRCUIT
(light pink)	ENGINE CONTROL CIRCUIT
(yellow)	HEATER AND AIR CONDITIONER CIRCUIT
(tan)	TURN SIGNAL / WIPER WASHER CIRCUIT
(red/black stripe)	RS-232 / RS-485 DATA LINK

OTHER COLOR DESCRIPTIONS

(light blue)	HIGHWAYS

ABBREV	COLOR
RD	RED
WH	WHITE
OR	ORANGE
YL	YELLOW
PK	PINK
BK	BLACK
GY	GRAY
PU	PURPLE
BR	BROWN
GN	GREEN
BU	BLUE

CALLOUTS

Callout Number (Machine Location from Component LocationsTable) → (52) VALVE GP - CONTROL ← Component Name

138-1234 ← Part Number

THIS SCHEMATIC IS FOR THE 416F, 422F, 428F, AND 434F BACKHOE LOADER ELECTRICAL SYSTEM

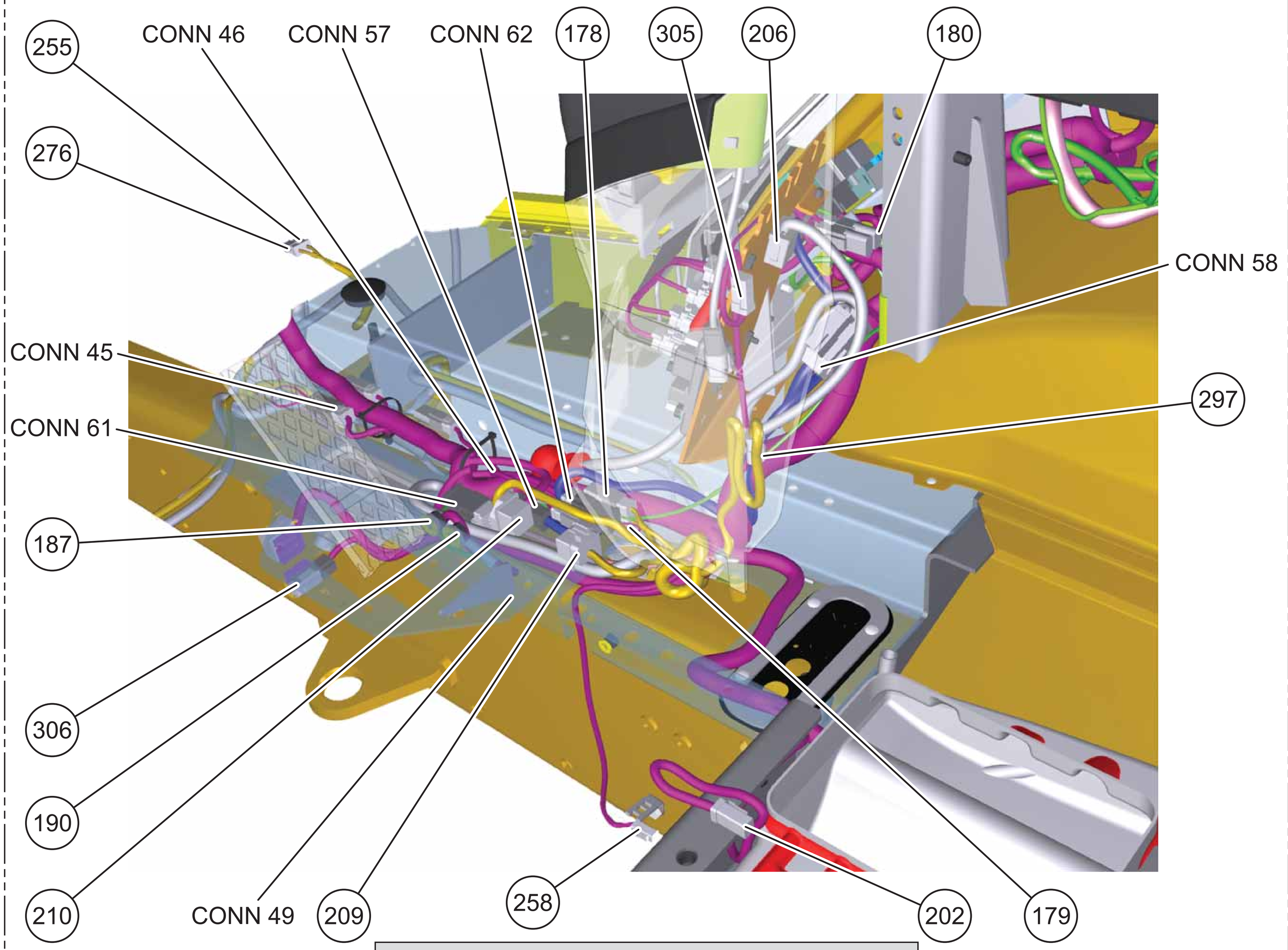
VOLUME 1 of 2: MECHANICAL CONTROL

MEDIA NUMBER: UENR4049

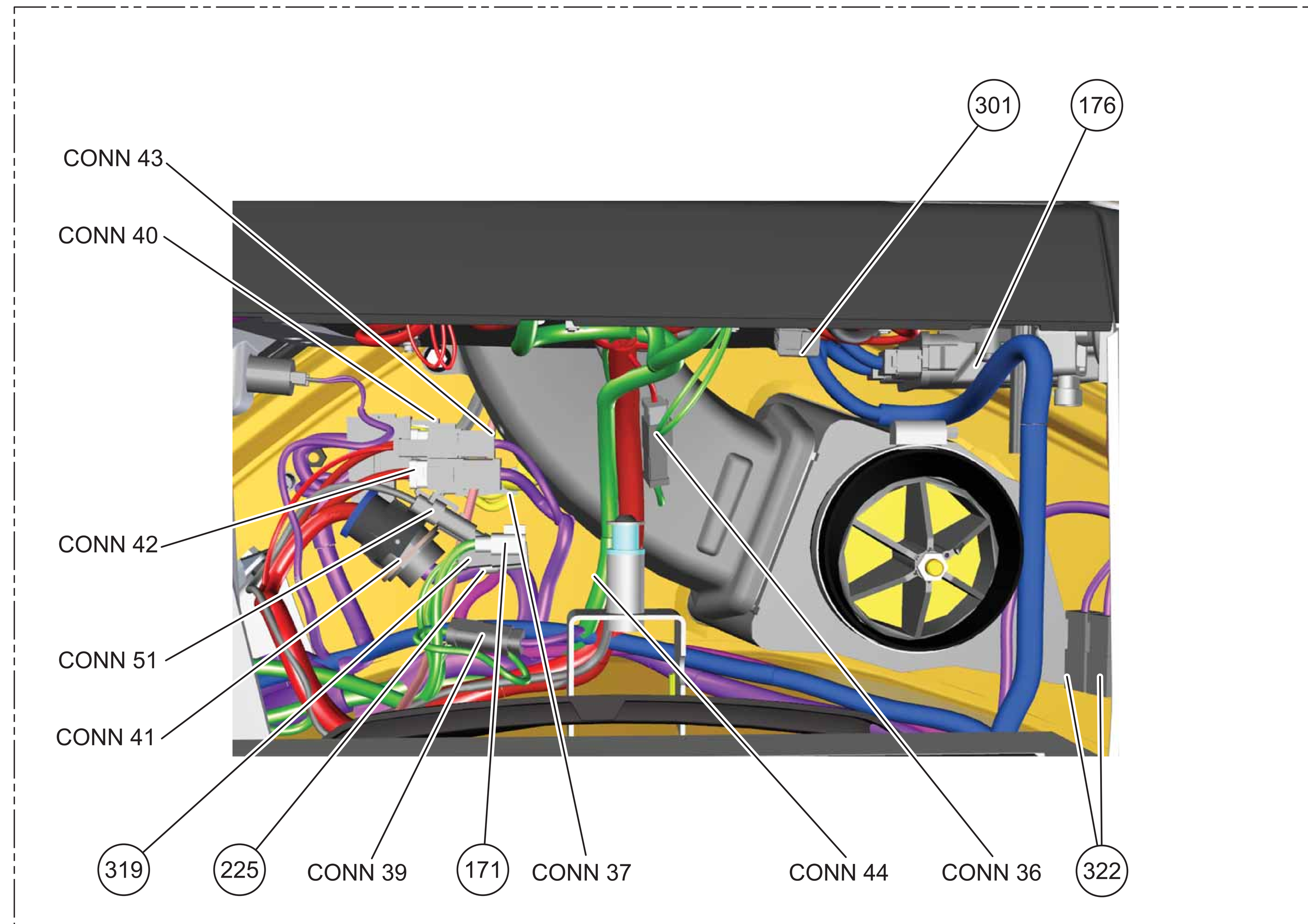
SCHEMATIC PART NUMBER: 338-0193, CHANGE: 01, VERSION: S

Components are shown installed on a fully operable machine with the key and engine off, transmission shifter in neutral and with parking brake set.

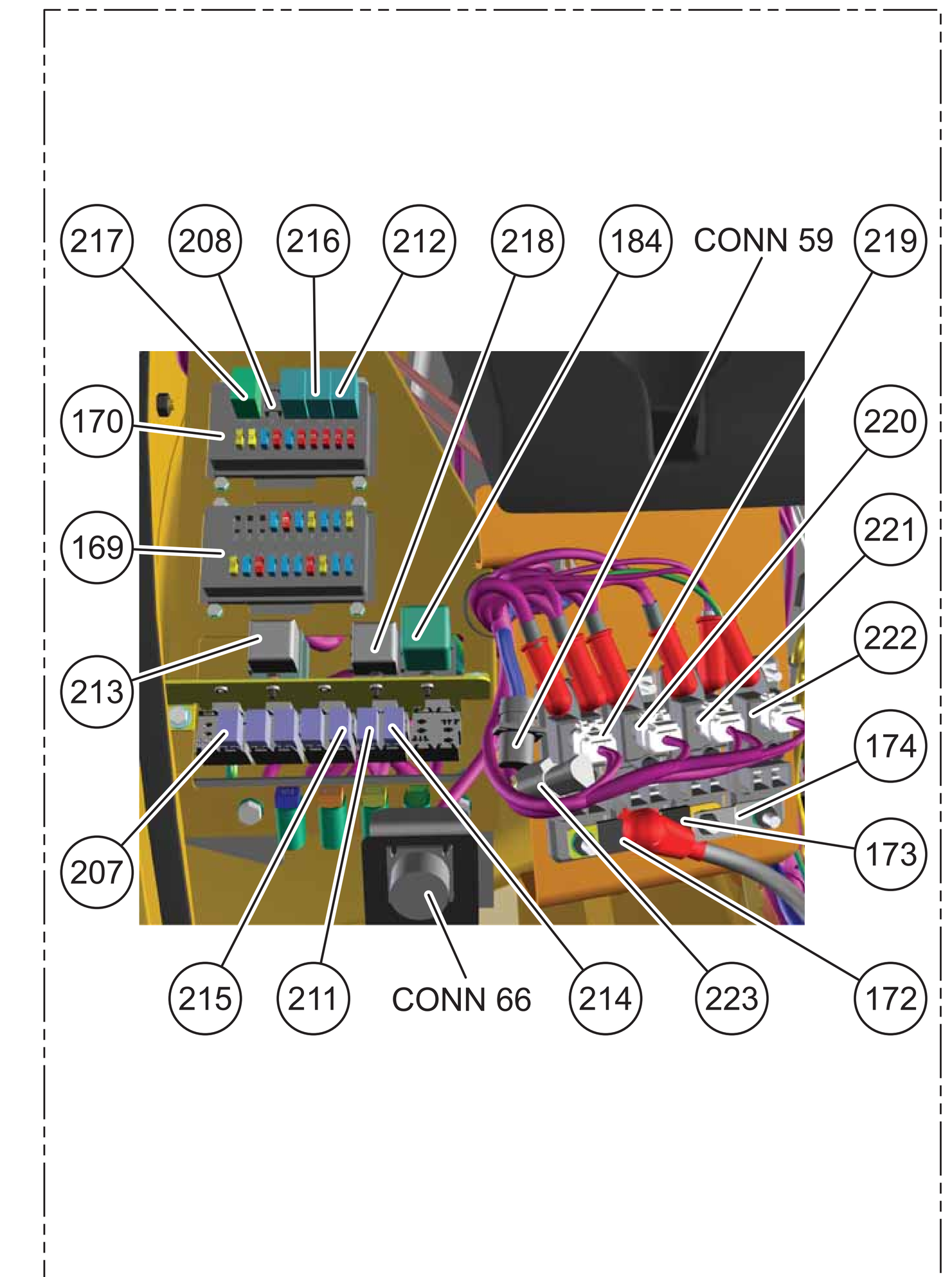
Refer to the appropriate Service Manual for Troubleshooting, Specifications and Systems Operations.



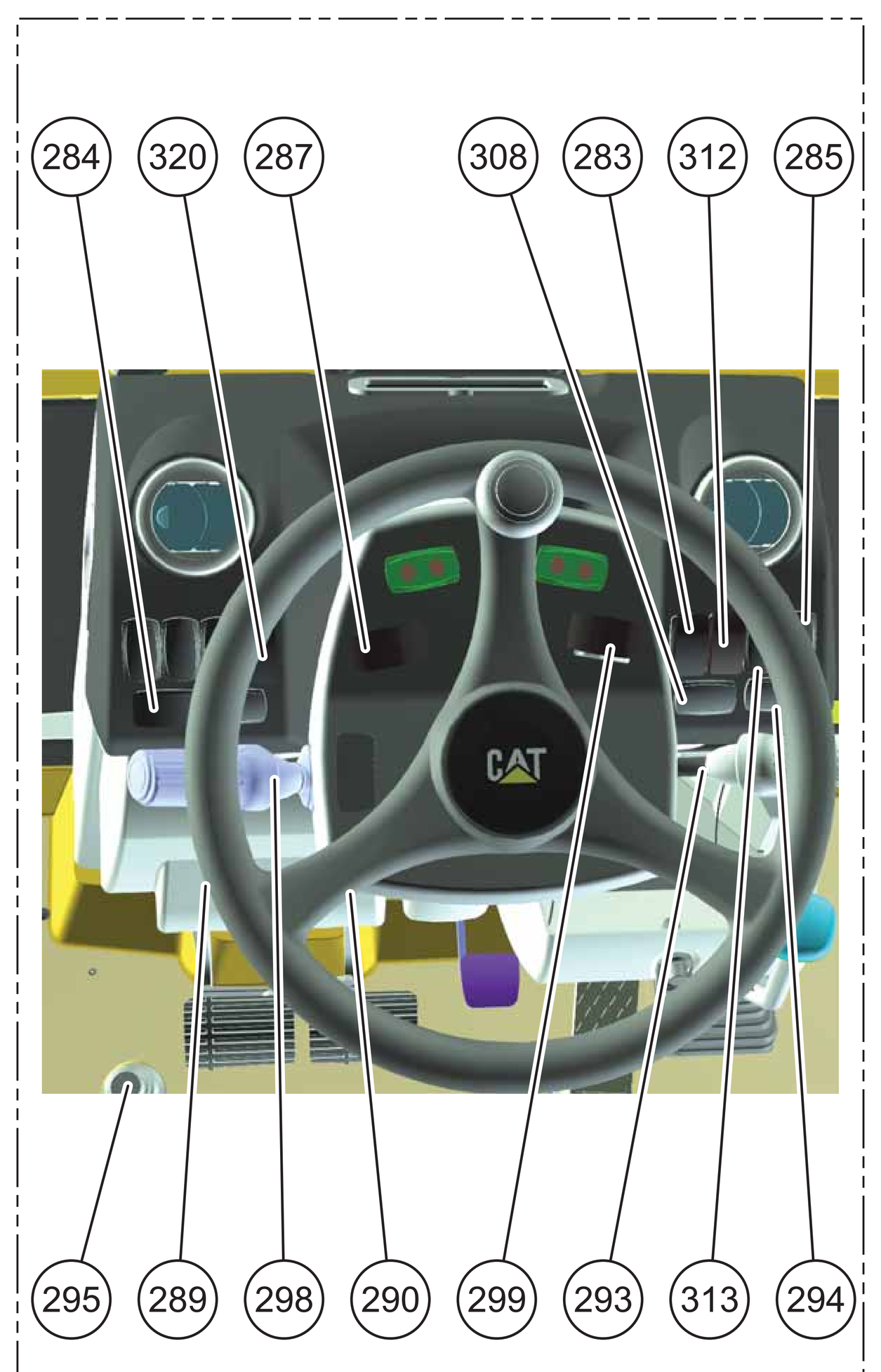
UNDER PLATFORM - FRONT VIEW



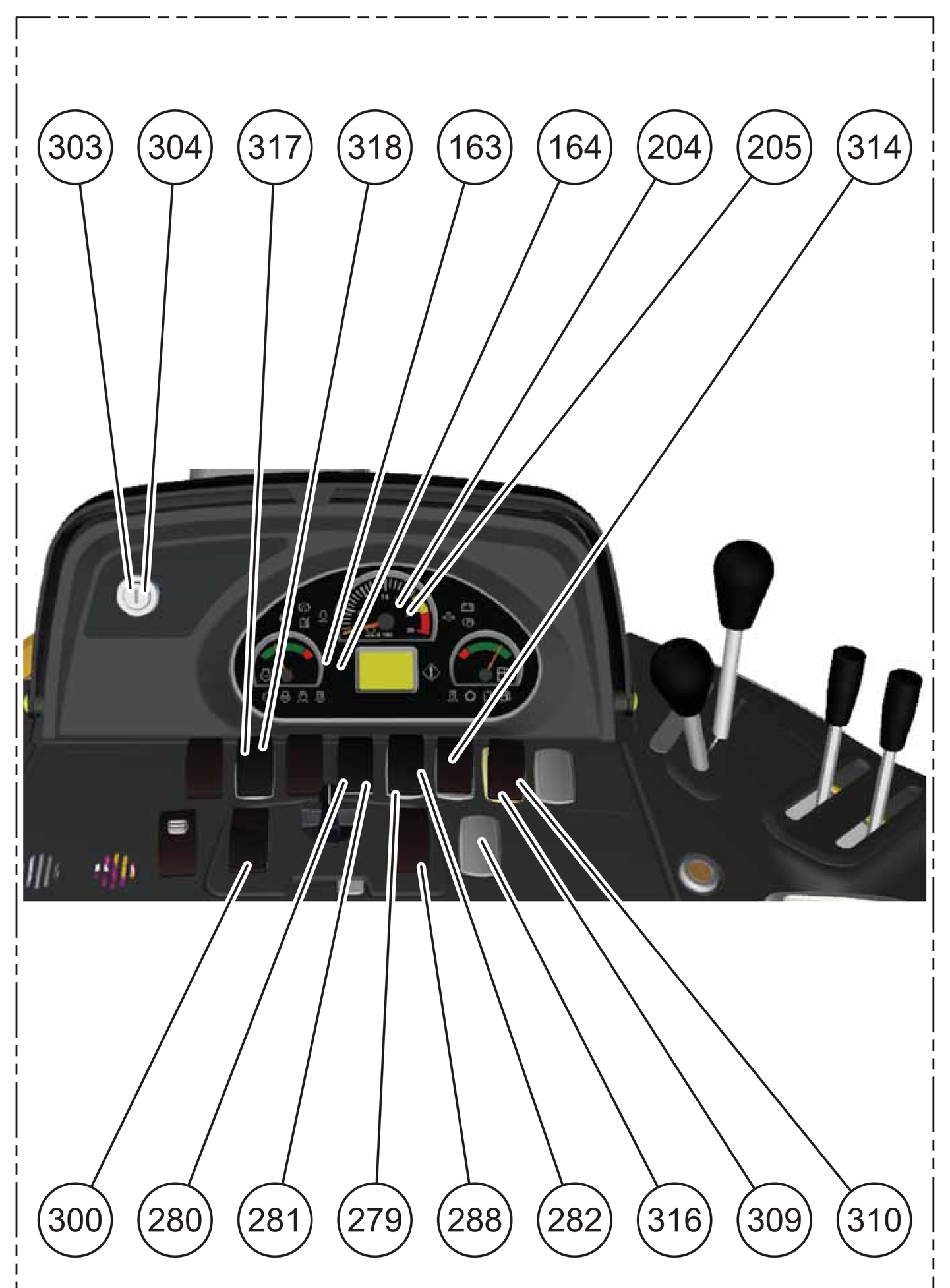
UNDER RIGHT CONSOLE



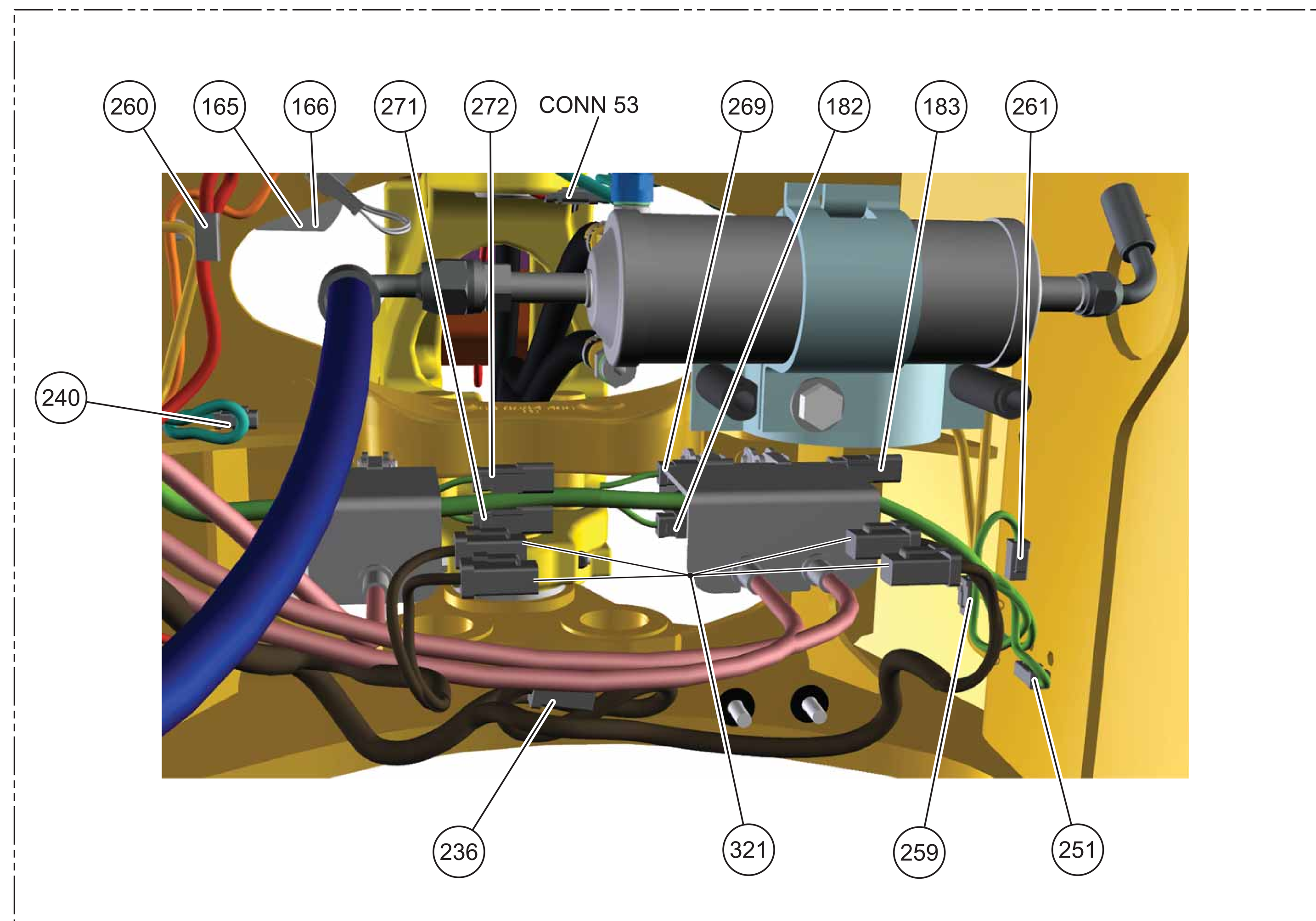
BLOCK GP - RELAY / FUSE



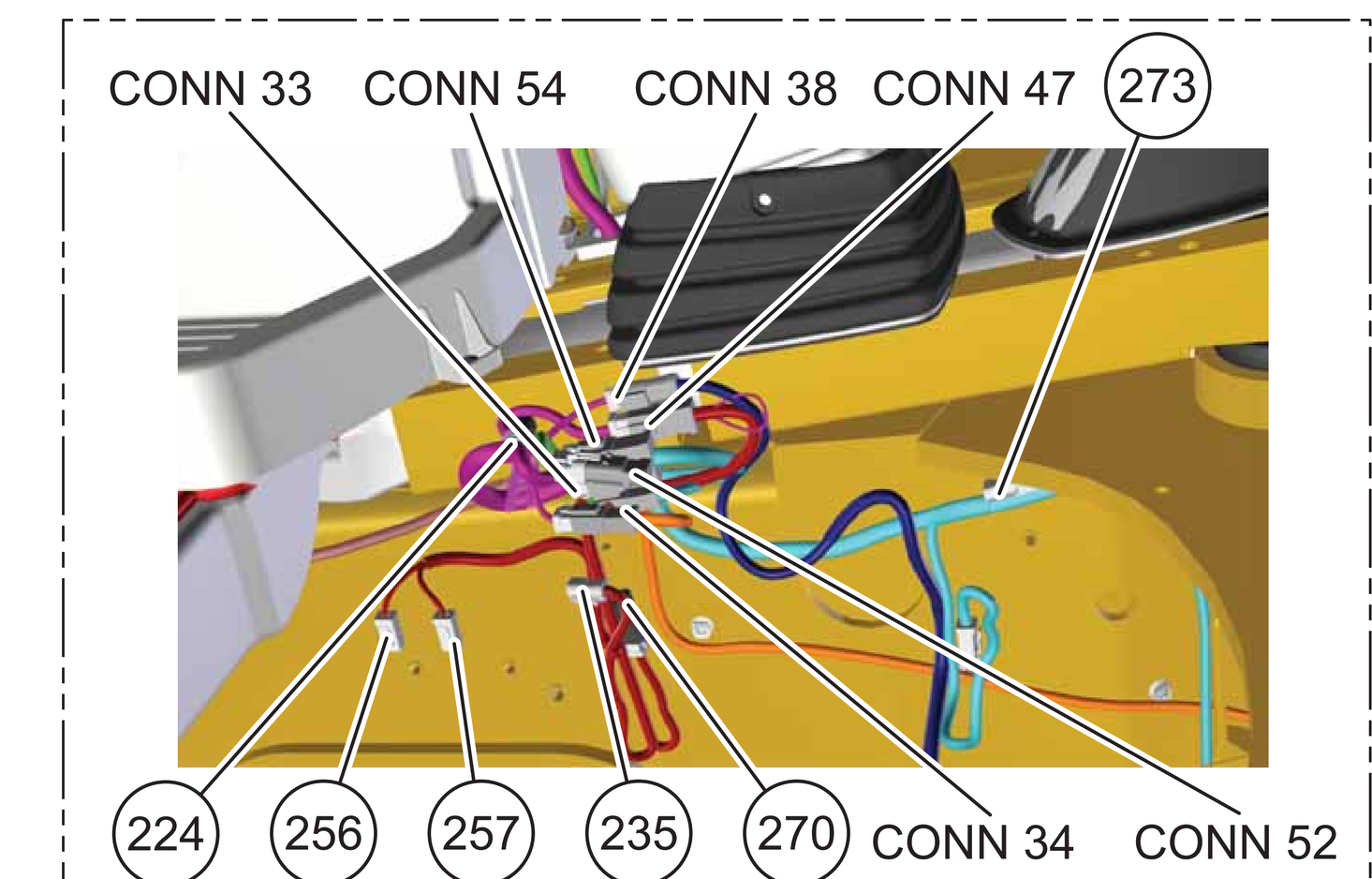
STEERING CONSOLE



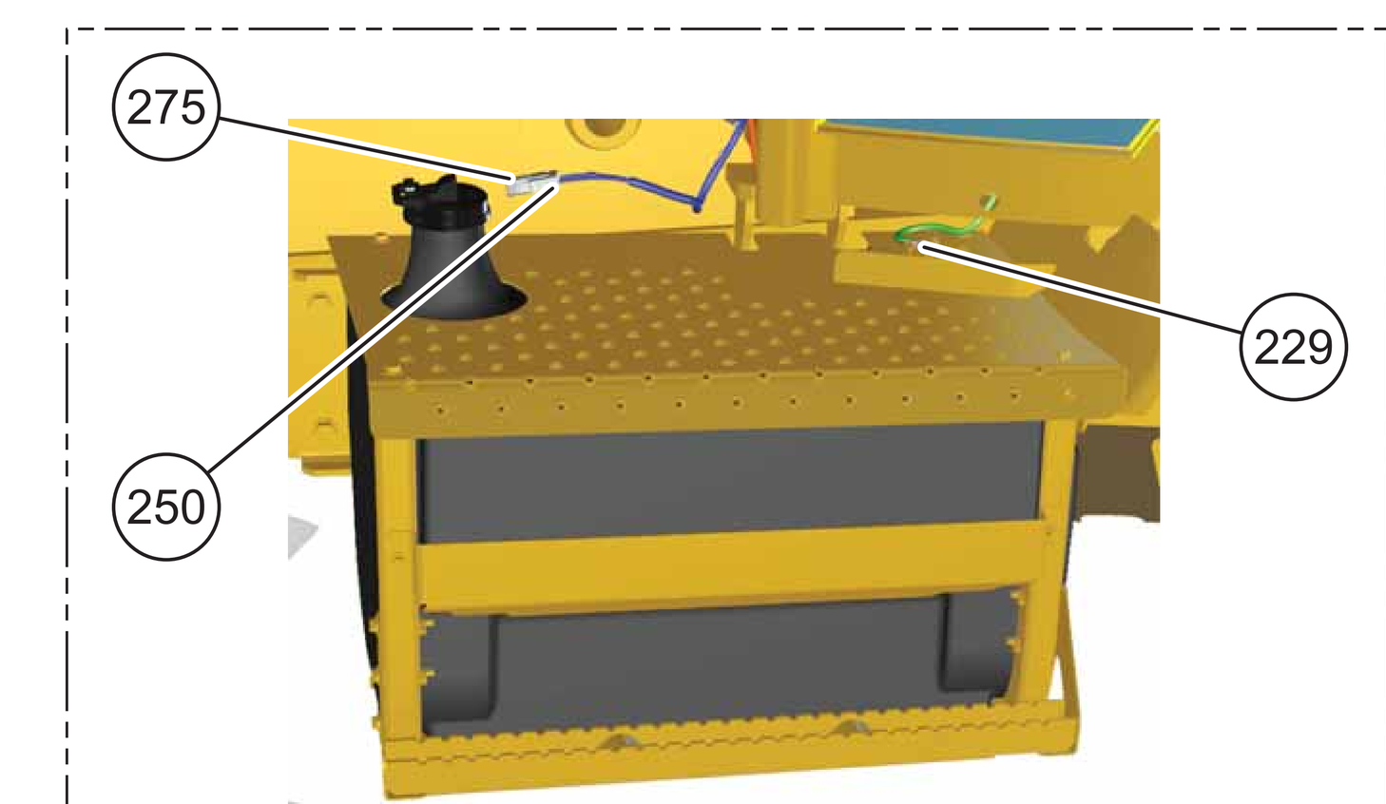
RIGHT CONSOLE



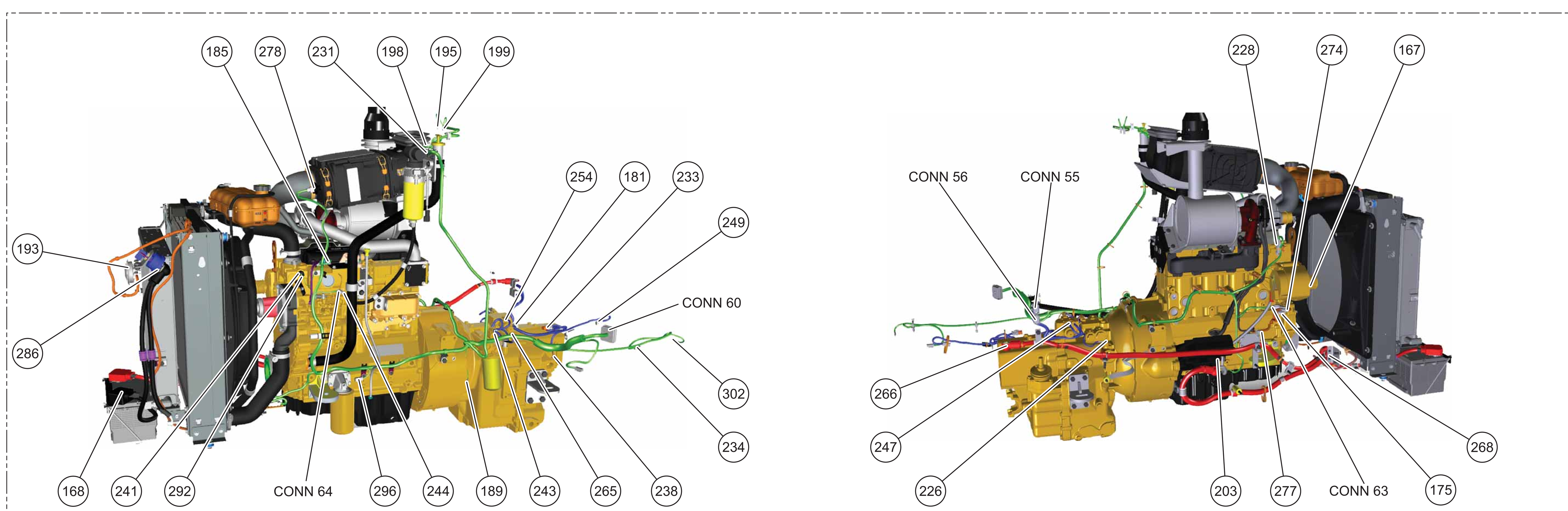
UNDER PLATFORM - REAR VIEW



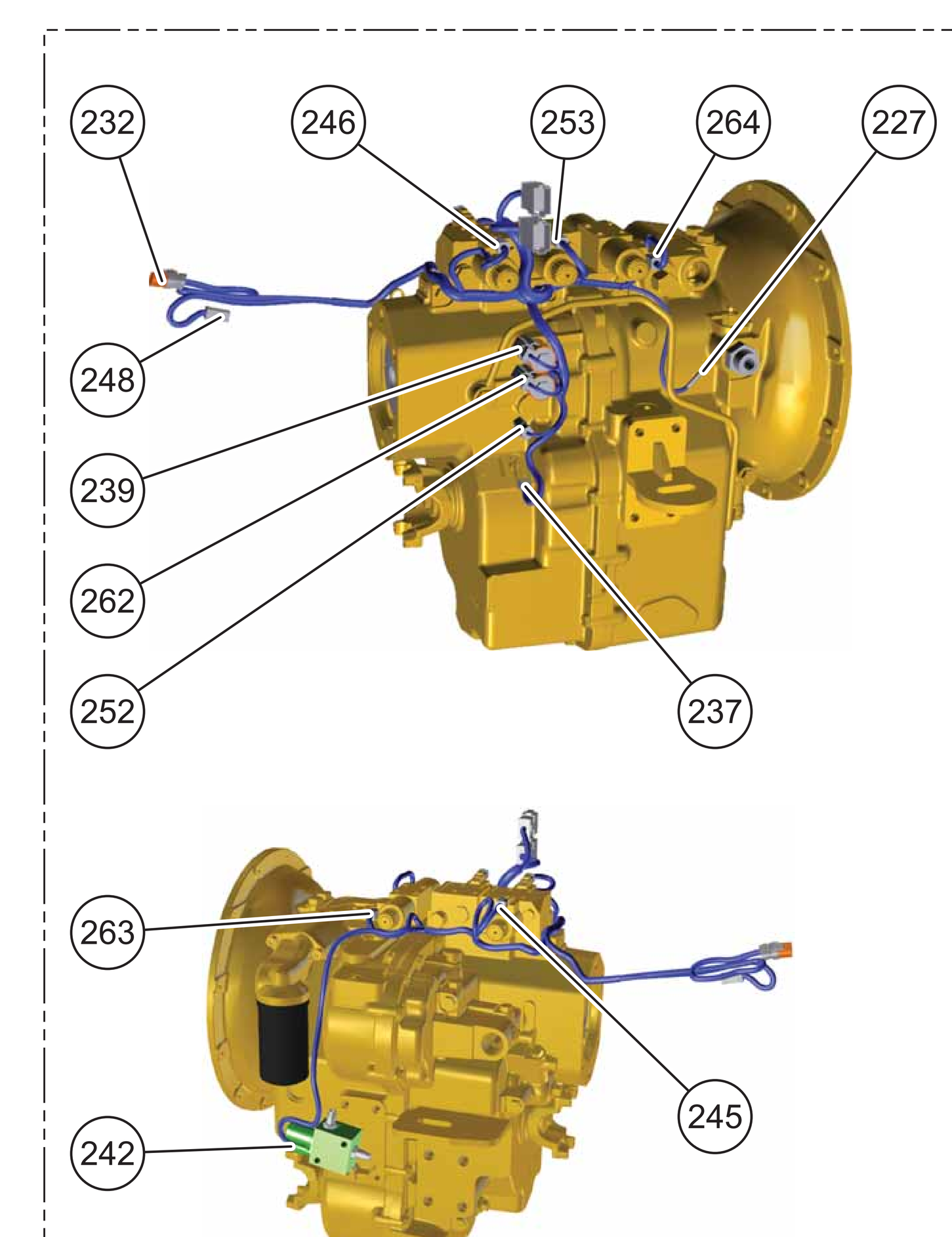
UNDER PLATFORM - RIGHT SIDE VIEW



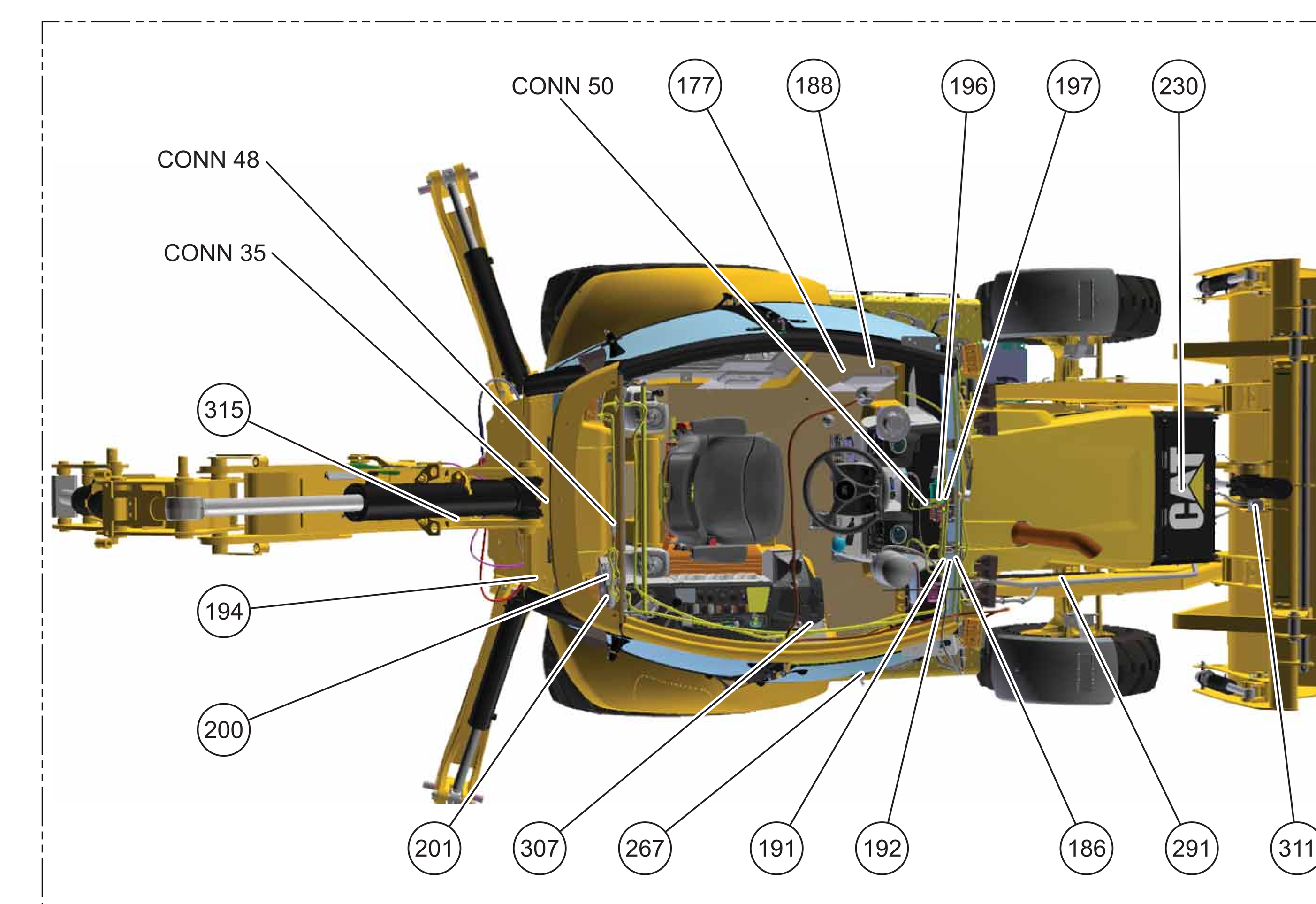
FUEL TANK



ENGINE WITH STD XMSN



XMXN - AUTOSHIFT



MACHINE TOP VIEW - CAB ROOF REMOVED

Component Location (Volume 2)					
Component	**Schematic Location**	**Machine Location**	**Component**	**Schematic Location**	**Machine Location**
Alarm - Action	D-16	163	Solenoid - Diff Lock As STD	I-1	243
Alarm - Action	A-16	164	Solenoid - Fuel Shutoff Turbo	E-1	244
Alarm - Backup (CP)	H-16	165	Solenoid - FWD High	J-1	245
Alarm - Backup (SS)	J-16	166	Solenoid - FWD Low	I-1	246
Alternator	E-1	167	Solenoid - FWD Low STD	H-1	247
Battery	E-3	168	Solenoid - Hyd Torque Limit	J-1	248
Block As - Fuse	H-6	169	Solenoid - HYD Torque Limit STD	I-1	249
Block As - Fuse	I-6	170	Solenoid - LH Lock Valve	D-5	250
Blower Gp - Cab heater	H-15	171	Solenoid - Lockout	I-15	251
Bus Bar 1	J-6	172	Solenoid - Lockup Clutch	J-1	252
Bus Bar 2	J-5	173	Solenoid - Rev As	I-1	253
Bus Bar 3	J-5	174	Solenoid - REV As STD	I-1	254
Compressor Gp - A/C Clutch	G-1	175	Solenoid - RH Lock Valve	D-5	255
Control Gp - AWS	A-9	176	Solenoid - Ride Control 1	E-9	256
Control Gp - Machine ECM	I-11	177	Solenoid - Ride Control 2	E-9	257
Diode - Blocking 1	C-6	178	Solenoid - RTD	E-11	258
Diode - Blocking 2	C-6	179	Solenoid - Side Shift Left	J-15	259
Diode - Fuel Lift Pump	F-6	180	Solenoid - Side Shift Lock	J-16	260
Diode - REV Solenoid	H-1	181	Solenoid - Side Shift Right	I-15	261
Diode - Side Shift 1	I-15	182	Solenoid - Speed Clutch 1	J-1	262
Diode - Side Shift 2	I-15	183	Solenoid - Speed Clutch 2	J-1	263
Flasher	F-6	184	Solenoid - Speed Clutch 3	J-1	264
Glow Plugs	D-1	185	Solenoid - STD AWD	I-1	265
Ground - Cab RF	D-10	186	Stud - Cab Power	F-3	266
Ground - Control	G-6	187	Stud - Jump Start	F-3	267
Ground - ECM Cab	F-11	188	Stud - Power	E-2	268
Ground - Engine	G-2	189	Suppressor - Lockout Solenoid	I-15	269
Ground - Lower Cab	G-6	190	Suprerssor - ARC Ride Control	E-9	270
Ground - Upper Cab	C-9	191	Supressor - ARC (Side Shift Left)	J-15	271
Ground - Upper Cab	G-15	192	Supressor - ARC (Side Shift Right)	I-15	272
Horn - Forward	E-1	193	Supressor - ARC (SS Lock)	J-16	273
Horn - RR	J-16	194	Supressor - ARC HVAC	G-1	274
Motor Gp - Front Washer	F-1	195	Supressor - ARC Load Check Disable 1	D-5	275
Motor Gp - Front Wiper	C-9	196	Supressor - ARC Load Check Disable 2	C-5	276
Motor Gp - Front Wiper	D-7	197	Switch - A/C Refrigerant Pressure	G-1	277
Motor Gp - Fuel Lift Pump	E-2	198	Switch - Air Filter	F-2	278
Motor Gp - Rear Washer	F-1	199	Switch - Attach Rear Work Lamp	B-15	279
Motor Gp - Rear Wiper	D-9	200	Switch - Attch Front Work Lamp	D-15	280
Motor Gp - Rear Wiper	B-12	201	Switch - Attch Front Work Lamp	B-15	281
Motor Gp - Seat	D-4	202	Switch - Attch Rear Work Lamp	D-15	282
Motor Gp - Starter	D-2	203	Switch - Auto Man	H-7	283
Panel Gp - Instrument	E-16	204	Switch - AWD	J-7	284
Panel Gp - Instrument	B-16	205	Switch - AWS	A-11	285
Radio - Prod Link	H-2	206	Switch - Battery Disconnect	E-3	286
Relay - A/C Shutoff	H-13	207	Switch - Beacon	H-8	287
Relay - AWD	H-6	208	Switch - Blower Speed	H-15	288
Relay - Dead Engine Lower Command	C-5	209	Switch - Brake (LH)	I-8	289
Relay - Dead Engine Lower Enable	C-5	210	Switch - Brake (RH)	I-8	290
Relay - Fuel Lift Pump	F-6	211	Switch - Bucket POS	E-10	291
Relay - FWD Horn	I-6	212	Switch - Cold Start Adv	F-1	292
Relay - Hi Speed	H-13	213	Switch - Column Multi Function	H-8	293
Relay - Neutral Start	F-6	214	Switch - Crab Circle	A-11	294
Relay - Park Brake Alarm	E-6	215	Switch - Differential Lock	I-8	295
Relay - Rear Horn	I-6	216	Switch - Engine Oil Pressure	F-2	296
Relay - Ride Control	H-6	217	Switch - Float Detent Pressure	D-5	297
Relay - Start	C-4	218	Switch - FNR Control	I-8	298
Relay As - PRM Module 1	J-6	219	Switch - Hazard	G-8	299
Relay As - PRM Module 2	J-5	220	Switch - Heater A/C	H-15	300
Relay As - PRM Module ENG	J-5	221	Switch - Horn	E-15	301
Relay As - PRM Module HVAC	J-5	222	Switch - HYD Oil Filter Bypass	G-1	302
Resistor - Can Terminating 1	F-10	223	Switch - Key	D-16	303
Resistor - Can Terminating 2	I-14	224	Switch - Key	A-16	304
Resistor - Motor Speed	G-15	225	Switch - Neutralizer Loader Handle	D-4	305
Sender - Conv Temp	H-1	226	Switch - Neutralizer XMSN Handle	D-4	306
Sender - Conv Temp	I-1	227	Switch - Park Brake	E-14	307
Sender - Coolant Temp	F-2	228	Switch - Rear Fog Lamp	H-7	308
Sender - Fuel Level	F-2	229	Switch - Rear Wiper	E-15	309
Sensor - FR Axly Posn	A-11	230	Switch - Rear Wiper	B-15	310
Sensor - Fuel Water Separator	F-1	231	Switch - Return to Dig	E-10	311
Sensor - Hyd Load Auto	J-3	232	Switch - Ride Control	I-7	312
Sensor - HYD Load STD	H-3	233	Switch - Roading	I-7	313
Sensor - Hyd Oil Temp	G-1	234	Switch - Side Shift Lock	D-15	314
Sensor - Ride Control	D-10	235	Switch - Stability Pressure	B-7	315
Sensor - RR Axle Posn	A-8	236	Switch - Stabliity Warning	B-10	316
Sensor - XMSN out SPD	J-3	237	Switch - Start Aid	D-15	317
Sensor - XMSN Out SPD STD	H-3	238	Switch - Start Aid	A-15	318
Solenoid - AWD As	J-1	239	Switch - Thermostat	G-15	319
Solenoid - Bleed Valve	B-8	240	Switch - XMSN Lock	J-7	320
Solenoid - Cold Start Adv	E-1	241	Valve Gp - AWS	A-8	321
Solenoid - Diff Lock As	J-1	242	Valve Gp - Stabilizer	I-14	322

Connector Location (Volume 2)			
Connector Number	**Schematic Location**	**Connector Number**	**Schematic Location**
CONN 33	J-14	CONN 50	C-7, C-10
CONN 34	H-16, J-14	CONN 51	B-10
CONN 35	I-16	CONN 52	B-9
CONN 36	B-16, D-16, G-14	CONN 53	B-8
CONN 37	D-12, F-16	CONN 54	A-9
CONN 38	J-14	CONN 55	I-2, J-3, J-4
CONN 39	E-14, H-13	CONN 56	I-2, J-3, J-4
CONN 40	C-7, C-12, E-14	CONN 57	H-3
CONN 41	B-14, D-14	CONN 58	H-1, H-3
CONN 42	A-14, D-14	CONN 59	H-3
CONN 43	A-14, C-14	CONN 60	G-4
CONN 44	B-12, C-14	CONN 61	C-4
CONN 45	A-11, F-9	CONN 62	C-4, D-6
CONN 46	E-11	CONN 63	F-1
CONN 47	E-11	CONN 64	E-2
CONN 48	B-11	CONN 65	F-10
CONN 49	A-11		

The connectors shown in this chart are for harness to harness connectors. Connectors that join a harness to a component are generally located at or near the component. See the Component Location Chart.

Resistor, Sender and Solenoid Specifications			
Part No.	**Component Description**		**Resistance (Ohms)[1]**
244-3106	Sender:	Coolant Temp	54°C (130°F) - 560 to 716 110°C (230°F) - 72 to 81.8
362-3089	Sender:	Fuel Level (EST)	Empty: 246-252 Full: 27-33
363-8475	Sender:	Fuel Level (NON-EST)	Empty: 246-252 Full: 27-33
299-2212	Solenoid:	A/C Clutch	3.50 ± 0.15
274-8304	Solenoid:	Diff Lock, STD AWD, Speed Clutch 1	8.8 ± 0.4
238-4626	Solenoid:	Side Shift Left / Right	8.8
238-4628	Solenoid:	Ride Control	7.3

[1] At room temperature unless otherwise noted.

Related Electrical Service Manuals	
Title	**Form Number**
Starting Motor: 149-0539	SENR3828
Control: Machine	UENR2484

CATERPILLAR®

UENR4049
April 2013

Schematic

416F, 422F, 428F, and 434F Backhoe Loader Electrical System

416F:	422F:	428F:	434F:
LWT323-UP	LRH696-UP	LBH1573-UP SJW437-UP	LDH1-UP FLY1-UP

Volume 2 of 2: Electronic Control

Printed in U.S.A.

Harness And Wire Electrical Schematic Symbols

Symbols

Pressure Symbol | Temperature Symbol | Level Symbol | Flow Symbol | Circuit Breaker Symbol

Symbols and Definitions

Fuse: A component in an electrical circuit that will open the circuit if too much current flows through it.

Switch (Normally Open): A switch that will close at a specified point (temp, press, etc.). The circle indicates that the component has screw terminals and a wire can be disconnected from it.

Switch (Normally Closed): A switch that will open at a specified point (temp, press, etc.). No circle indicates that the wire cannot be disconnected from the component.

Ground (Wired): This indicates that the component is connected to a grounded wire. The grounded wire is fastened to the machine.

Ground (Case): This indicates that the component does not have a wire connected to ground. It is grounded by being fastened to the machine.

Reed Switch: A switch whose contacts are controlled by a magnet. A magnet closes the contacts of a normally open reed switch; it opens the contacts of a normally closed reed switch.

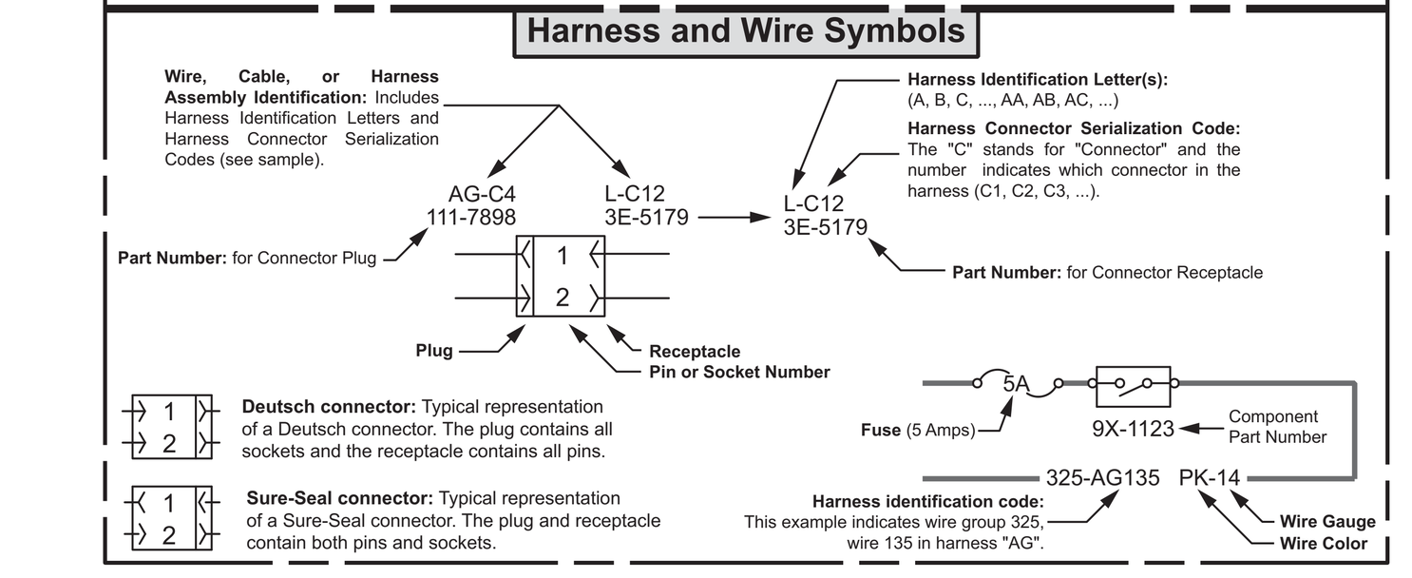
Sender: A component that is used with a temperature or pressure gauge. The sender measures the temperature or pressure. Its resistance changes to give an indication to the gauge of the temperature or pressure.

Relay (Magnetic Switch): A relay is an electrical component that is activated by electricity. It has a coil that makes an electromagnet when current flows through it. The electromagnet can open or close the switch part of the relay.

Solenoid: A solenoid is an electrical component that is activated by electricity. It has a coil that makes an electromagnet when current flows through it. The electromagnet can open or close a valve or move a piece of metal that can do work.

Magnetic Latch Solenoid: A magnetic latch solenoid is an electrical component that is activated by electricity and held latched by a permanent magnet. It has two coils (latch and unlatch) that make electromagnet when current flows through them. It also has an internal switch that places the latch coil circuit open at the time the coil latches.

Harness and Wire Symbols



UENR4049 VOL 2 OF 2
42 Page, (Dimensions: 56 inches x 35 inches)

UENR4049 VOL 2 OF 2

42 Page, (Dimensions: 56 inches x 35 inches)

THIS SCHEMATIC IS FOR THE 416F/422F/428F/434F MECHANICAL BACKHOE LOADER TIER 4i PHASE 2 PROGRAMME (STAGE 2 AND STAGE 3A ENGINES) (338-0193 CHG 00)

COMPONENTS ARE SHOWN INSTALLED ON A FULLY OPERABLE MACHINE WITH THE KEY AND ENGINE OFF, PARK BRAKE ON AND THE TRANSMISSION SHIFTER IN NEUTRAL.

NOTE LOC	NOTE	DESCRIPTION
VARIOUS	NOTE A:	ASSEMBLE TERMINALS TO DESIGNATED STUD
SH 2 A-9	NOTE B:	THERMOSTAT FITTED TO MACHINES WITH AIR CON ONLY.
VARIOUS	NOTE C:	WIRES ARE TWISTED. ONE TWIST PER 25mm. WIRES TO BE TWISTED ARE: 892-BR AND 893-GN, F711-GN AND F712-GY AND WH AND E901-GN
VARIOUS	NOTE D:	NOT USED ON MECHANICAL MACHINE
SH 1 G-8 SH 3 G-8	NOTE E:	CLOSED WHEN BRAKE IS DEPRESSED
SH 1 A-13	NOTE F:	CONNECT WIRE AS. FROM PIN 2 TO 3 ON CONNECTOR RH-C6.
VARIOUS	NOTE H:	OPTIONAL - BASED ON MACHINE CONFIGURATION.
VARIOUS	NOTE J:	ATTACHMENT HARNESS
SH 2 G-7	NOTE K:	WHEN LOADER LOCKS ARE INSTALLED, REMOVE JUMPER AND CONNECT PM-C46 TO LN-C2. IF POWER SHIFT OPTION IS USED CONN PL-C46 TO LN-C2
VARIOUS	NOTE L:	STD FRONT WORK AND STD REAR WORK SWITCHES ARE FOR STANDARD FLOOD LAMP ARRANGEMENTS (4 LAMPS TOTAL). ATCH FRONT WORK LAMP AND ATCH REAR WORK LAMP SWITCHES ARE FOR MACHINES WITH OPTIONAL ATTACHMENT FLOOD LAMPS (8 LAMPS TOTAL).
SH 2 B-8 SH 2 B-9	NOTE M:	WHEN USING A CAB WITH HEATER ONLY, HEATER AC SW IS REPLACED WITH VENT SW.
SH 2 A-9	NOTE N:	NORMALLY CLOSED AT PROPER REFRIGERANT CHARGE
VARIOUS	NOTE P:	FOR MACHINES WITHOUT LOAD CHECK.
SH 1 I-7	NOTE R:	FOR ITALY MACHINES, ADD JUMPER AS. 8Y-7833 TO CONN PM-C21
SH 2 H-6	NOTE S:	NOT AVAILABLE ON 422E
SH 1 H-3 SH 2 A-7	NOTE T:	FOR HVAC ATTACHMENT CONNECT 122-BU FROM HVAC HARNESS TO HVAC PRM MODULE SB STUD.
SH 1 D-14	NOTE W:	FOR POWER SIDESHIFT OPTION REPLACE SIDE SHIFT LOCK SW WITH POWER SS SW.
SH 1 H-7	NOTE X:	FOR ITALY MACHINES, REPLACE AWD SWITCH WITH AWD ITALY SWITCH
VARIOUS	NOTE Y:	FOR 434E MECHANICAL EST MACHINES ONLY
SH 2 B-2	NOTE Z:	CONNECTION SUPPLIED WITH ENGINE

SYMBOL	DESCRIPTION
┼ (dot)	CIRCUIT CONNECTED
┼	CIRCUIT NOT CONNECTED
⏚	ELECTRICAL CONNECTION TO MACHINE STRUCTURE
⏚ (dashed)	INTERNAL ELECTRICAL CONNECTION TO SURFACE OF COMPONENT
→)—	CONNECTOR
H#	CIRCUIT GROUPING DESIGNATION
- - -	ATCH WIRE, CABLE, COMPONENT
○-○	SPLICE
○	BLADE, SPADE, RING OR SCREW TERMINAL

ABBREV	COLOR
RD	RED
WH	WHITE
OR	ORANGE
YL	YELLOW
PK	PINK
BK	BLACK
GY	GRAY
PU	PURPLE
BR	BROWN
GN	GREEN
BU	BLUE

WIRE GROUP COLOR DESCRIPTIONS

- GROUND CIRCUIT
- WIRES THAT HAVE SYSTEM VOLTAGE WHEN THE KEY SWITCH IS OFF
- WIRES THAT HAVE SYSTEM VOLTAGE WHEN THE KEY SWITCH IS ON
- STARTING CIRCUIT
- START AID CIRCUIT
- TRANSMISSION CONTROL CIRCUIT
- ENGINE CONTROL CIRCUIT
- HEATER AND AIR CONDITIONER CIRCUIT
- TURN SIGNAL / WIPER WASHER CIRCUIT
- RS-232 / RS-485 DATA LINK

OTHER COLOR DESCRIPTIONS

- HIGHWAYS

CALLOUTS

Callout Number (Machine Location from Component LocationsTable) → (52) VALVE GP - CONTROL ← Component Name
138-1234 ← Part Number

THIS SCHEMATIC IS FOR THE 416F, 422F, 428F, AND 434F BACKHOE LOADER ELECTRICAL SYSTEM
VOLUME 2 of 2: ELECTRONIC CONTROL
MEDIA NUMBER: UENR4049
SCHEMATIC PART NUMBER: 338-0193, CHANGE: 01, VERSION: S
Components are shown installed on a fully operable machine with the key and engine off, transmission shifter in neutral and with parking brake set.
Refer to the appropriate Service Manual for Troubleshooting, Specifications and Systems Operations.